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ABSTRACT

The academic success of students enrolled in remedial English and mathematics programs was compared at two large state universities, California State University, Northridge, and San Diego State University. The sample consisted of three successive freshmen classes, those entering in fall semesters 1981, 1982, and 1983. The remedial English programs had enrollments ranging from 334 to 453, while the remedial mathematics programs ranged from 110 to 479. The students were tracked through fall 1984, and the longitudinal success measures were annual pass-fail rates and persistence rates. English remedial and nonremedial cohorts were formed within three score categories for the verbal part of Scholastic Aptitude Test (SAT), while remedial and nonremedial mathematics cohorts were formed with three score categories of the math part of the SAT. No significant differences were found in the persistence rates of the remedial English or math students, when compared with nonremedial groups at either campus. Significant differences were found in the pass-fail rates of remedial and nonremedial English cohorts at both campuses. The remedial English cohorts averaged 72 percent passing, compared to 84 percent passing for the average nonremedial cohort. (SW)

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Remedial Education Programs at Two State Universities:
A Comparison of Freshman Persistence and Performance

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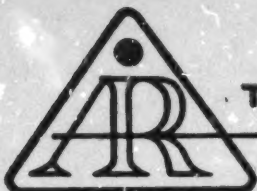
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Elizabeth P. Fox, Chair
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Abstract

The academic success of students enrolled in remedial English and mathematics programs was compared at two large, state universities. The longitudinal success measures were annual pass-fail rates and persistence rates. English remedial and nonremedial cohorts were formed within three SAT-Verbal score categories, while remedial and nonremedial mathematics cohorts were formed within three SAT-Math score categories. No significant differences were found in the persistence rates of the remedial English or math students, when compared with nonremedial groups at either campus. Significant differences were found in the pass-fail rates of remedial and nonremedial English cohorts at both campuses. The remedial English cohorts averaged 72% passing, compared to 84% passing for the average nonremedial cohort.

In response to declining standardized test scores a "minimum competency" movement began in the United States in the mid-1970s. Today, the issue of overcoming student underpreparation for college continues to be a major concern (Akst, 1981; Magarrell, 1981; Myers, 1982; University of California, 1982; Watkins, 1982). It has been estimated that the City University of New York spends some \$35 million a year on remediation, and the cost in 1980-81 was at least \$66 million for the California Community Colleges. In 1978 a comprehensive survey identified 1,848 remedial learning centers on 1,433 campuses in the United States and Canada (Maxwell, 1979). Indeed, remedial education courses are one of the fastest growing areas of the college curriculum (California Postsecondary Education Commission, 1983).

Although remedial education is a growing phenomenon, little is known about the effectiveness of these programs. Procedures used to evaluate college remedial programs are extremely diverse. Of all the research designs used to evaluate remedial programs, the single-group pretest-posttest design is undoubtedly the simplest and most commonly used (Smith, 1982). Unfortunately, while postprogram measures are typically found to be significantly higher than preprogram measures, the results cannot be solely attributed to the effectiveness of the remedial program (Dumont, 1982). This design has been dismissed as "useless" (Wolf, 1979, p. 143).

The second most common design incorporates the use of a control group which does not receive remedial instruction. Lack of comparability of the remedial and control groups is the most serious weakness of this design. Random assignment would assure comparability but it is difficult to deny

remediation to the underprepared. The present study used this control group design. Postprogram evaluation measures used with this design have usually been subsequent grades, units earned and persistence rates. For example, Gash (1983) found that as compared to the control group the remedial groups had slightly lower retention rates, earned a similar number of units, but with a somewhat lower grade point average.

The purpose of the present study was to examine the impact of remedial English and remedial mathematics programs on freshman persistence and grade performance at two large, urban state universities. Control and remedial groups were not comparable in academic preparation so comparisons between them were made within the same level on the Scholastic Aptitude Test (Educational Testing Service, 1948-1980).

METHOD

The longitudinal study was conducted at California State University, Northridge and at San Diego State University, referred to as N and S in this report. These are large, public state universities with total undergraduate enrollments of approximately 22,700 and 25,600 in this time period. Both are commuter schools located in large southern California metropolitan areas.

The remedial English and remedial mathematics programs use small classes and tutoring to help the student attain college level skills in standard written English and in basic mathematics. These skills were measured by locally developed competency tests, which serve as graduation requirements. Enrollment in a remedial program was required of students with low scores on a competency test, but many students were self-selected.

The basic design was to compare the academic success of remedial and nonremedial groups in three freshman classes. The nonexperimental design did not involve random assignment to groups. Each group was tracked for either one, two or three years. The first measure of academic success was persistence, the percent who continue in attendance in following semesters. The second measure of success was the annual pass-fail rate, the percent with annual grade point averages of 2.0 or more, on a four point scale.

Sample Selection

Selected were three successive freshmen classes, those entering in the fall semesters of 1981, 1982 and 1983. Foreign students were eliminated, since remedial programs may have a different meaning for them. It was also necessary to eliminate those few without Scholastic Aptitude Test (SAT) scores, as these scores were needed as a control variable. The net size of the freshman classes was 2,596, 2,827 and 2,828 at University N and 2,311, 2,359 and 2,760 at University S, for the three years respectively. The remedial English program had enrollments of 390, 335 and 334 at University N and 430, 453 and 413 at University S. The remedial mathematics program had enrollments of 110, 220 and 479 at University N and 373, 433 and 442 at University S.

Cohort Formation

Each freshman was assigned to a cohort based upon remedial status and stratified on SAT scores. The level of academic ability can be an important confounding variable since remedial students tend to be of lower

academic ability. English remedial and nonremedial cohorts were formed within three SAT-Verbal score categories, while remedial and nonremedial mathematics cohorts were formed within three SAT-Mathematics score categories. With the three score categories and two remedial status categories, each freshman was assigned to one of six English cohorts and also to one of six Mathematics cohorts. There was some overlap in the remedial cohorts as a few students were enrolled in both remedial programs.

Data Analysis

The 1981, 1982 and 1983 freshmen classes were each tracked through fall of 1984. Thus data on the first dependent variable consisted of persistence rates for six semesters on the 1981 freshmen, four semesters on the 1982 freshmen and two semesters on the 1983 freshmen. The other dependent variable was annual pass-fail rates for three years on the 1981 freshmen, two years on the 1982 freshmen and one year on the 1983 freshmen. Both dependent variables were dichotomies so that the same statistical analysis was performed on each of the 3 X 2 X 2 frequency tables. The null hypothesis of interest allows different persistence rates in the three SAT categories but specifies no difference between the remedial and nonremedial conditions within each SAT level. A log-linear model was specified for this hypothesis and the chi-square test of significance was computed using the BMDP program 4F (Dixon, 1983). Using two degrees of freedom for SAT level control leaves three degrees of freedom for the chi-square test of remedial-nonremedial differences.

RESULTS

Table 1 shows the persistence rates for the remedial English cohorts for all three freshman classes at both universities. Only a single null hypothesis was rejected at the 5% level, out of the 24 tests. Not all of the significance tests were independent, only six involve completely different groups of subjects. Remedial and nonremedial persistence rates within a given SAT-Verbal category showed little difference. Simply averaging the 72 differences, which ignores cohort size and lack of independence, yields a four percent disadvantage for the remedial English cohorts. In only 20 of the 72 comparisons in Table 1 did the remedial cohort have the higher persistence. Overall, the null hypothesis model seemed to fit the data quite well.

Table 2 shows the persistence rates for the remedial mathematics cohorts for all three freshman classes and at both universities. Again, only a single null hypothesis was rejected at the 5% level, out of the 24 nonindependent tests. Remedial and nonremedial persistence rates within a SAT-M category were very similar. Simply averaging the 72 percentage differences gave a two point advantage to the remedial cohort. In 39 of the 72 comparisons the remedial cohort had the higher persistence rate. Generally, the null hypothesis model provided a good fit to these persistence rates.

Table 3 shows the pass-fail rates for the remedial English cohorts for three freshman classes at both universities. The pass-fail determination was made on those surviving to the end of one, two or three years. The declining number of survivors resulted in some very small cohorts. Thus it is best to examine the results separately by year. At

Table 1. Persistence Rates for English Remedial and Control Cohorts Based on SAT Verbal Scores

Table 1. Persistence Rates for English Remedial and Control Cohorts Based on SAT Verbal Scores															
SAT Eng. Scores	Remedial Status	Cohort Size	University N						Cohort Size	University S					
			Persistence Rates by Semester							Persistence Rates by Semester					
			2nd	3rd	4th	5th	6th	7th		2nd	3rd	4th	5th	6th	7th
1981 Freshmen															
200 - 340	Control	433	89	63	58	45	41	35	187	90	70	64	55	53	51
200 - 340	English	254	90	61	57	41	36	30	176	86	67	59	51	49	41
350 - 440	Control	901	91	75	72	58	53	47	763	91	74	68	58	55	52
350 - 440	English	127	89	68	65	50	46	43	201	94	77	70	62	59	55
450 - 800	Control	872	91	76	73	61	58	50	931	91	77	70	60	57	55
450 - 800	English	9	78	78	67	56	33	22	53	85	68	62	60	53	49
	Chi-Square		2.57	2.85	2.75	3.97	5.82	5.54		4.66	3.20	2.43	1.58	2.04	4.76
1982 Freshmen															
200 - 340	Control	457	88	69	62	51			161	93	72	66	59		
200 - 340	English	238	90	68	61	47			227	89	64	58	46		
350 - 440	Control	995	91	72	67	58			837	91	75	70	62		
350 - 440	English	91	91	70	63	55			191	92	75	71	61		
450 - 800	Control	1,040	93	75	70	58			908	91	75	70	62		
450 - 800	English	6	83	50	50	50			35	97	77	74	54		
	Chi-Square		1.03	1.90	1.95	1.24				3.87	3.04	2.75	7.38		
1983 Freshmen															
200 - 340	Control	447	88	70					217	89	71				
200 - 340	English	233	88	66					215	95	72				
350 - 440	Control	958	91	76					1,036	92	75				
350 - 440	English	88	91	72					162	93	78				
450 - 800	Control	944	89	74					1,094	91	73				
450 - 800	English	13	100	77					36	89	47				
	Chi-Square		2.91	2.41						4.88	11.04*				

* $p = .05$ for 7.81 and 3 df

Table 2. Persistence Rates for Mathematics Remedial and Control Cohorts Based on SAT Math Scores

SAT Math Scores	Remedial Status	Cohort Size	University N							University S						
			Persistence Rates by Semester							Persistence Rates by Semester						
			2nd	3rd	4th	5th	6th	7th		2nd	3rd	4th	5th	6th	7th	
<u>1981 Freshmen</u>																
200 - 340 Control		291	89	59	54	42	37	32	130	86	58	48	40	38	35	
200 - 340 Math		17	88	59	53	41	29	29	69	93	71	67	49	49	45	
350 - 440 Control		636	90	70	67	53	49	42	478	91	75	68	56	52	49	
350 - 440 Math		40	90	75	70	52	50	38	144	91	74	69	55	49	51	
450 - 800 Control		1,325	89	77	74	62	58	51	1,330	91	76	70	62	59	56	
450 - 800 Math		53	94	85	85	70	70	64	160	92	78	69	58	56	51	
Chi-Square			1.98	2.37	3.64	1.46	3.57	4.02		2.66	3.53	6.72	2.41	2.89	3.42	
<u>1982 Freshmen</u>																
200 - 340 Control		293	87	66	57	43			104	88	61	60	51			
200 - 340 Math		49	88	69	59	51			115	86	53	50	35			
350 - 440 Control		672	92	74	68	57			522	89	73	68	59			
350 - 440 Math		78	95	82	77	68			170	89	72	65	56			
450 - 800 Control		1,530	92	74	70	59			1,300	93	77	72	63			
450 - 800 Math		93	95	84	78	65			148	92	75	71	61			
Chi-Square			1.91	8.20*	6.56	5.43				0.62	1.48	2.60	6.60			
<u>1983 Freshmen</u>																
200 - 340 Control		289	87	67					154	85	63					
200 - 340 Math		161	89	71					108	94	69					
350 - 440 Control		715	90	74					640	91	76					
350 - 440 Math		200	92	74					176	90	72					
450 - 800 Control		1,345	90	75					1,524	93	75					
450 - 800 Math		118	92	78					158	94	72					
Chi-Square			1.36	1.21						5.72	2.43					

* p = .05 for 7.81 and 3 df

the end of the first year, the remedial English cohorts had lower pass-fail rates than the nonremedial cohorts at the same SAT-Verbal score level. This result was consistent at both universities and for all three freshman classes. The null hypothesis was rejected in five of the six cases. All but one of the 18 remedial-nonremedial differences favored the nonremedial group. Using unweighted averages, the remedial English cohort mean was 56% passing, compared to the nonremedial mean of 70% passing at the end of one year. At the end of two years, all four null hypotheses were rejected and all but one of the 12 remedial-nonremedial differences favored the nonremedial cohort. The average remedial cohort was 68% passing as compared to 80% passing grades for the average nonremedial cohort. Finally, at the end of three years, the null hypothesis was rejected at one university but not at the one where cohort sizes were much reduced. The remedial cohorts averaged 72% passing, compared to 84% passing for the average nonremedial cohort. Although the differences were not uniformly significant, the pass-fail rate was about 12% points higher for the nonremedial cohorts than for the remedial English cohorts.

Table 4 shows the pass-fail rates for the remedial mathematics cohorts for the three freshman classes at both universities. The differences between the remedial and nonremedial groups in pass/fail rates were much less for mathematics than for English. At the end of the first year, some remedial mathematics cohorts had higher, and some lower, pass-fail rates than the nonremedial cohorts within the same SAT-Mathematics score level. The unweighted average was 62% passing for remedial mathematics as compared to 67% passing for nonremedial cohorts. In only one of the six cases was it possible to reject the null hypothesis.

Table 3. Pass-Fail Rates for English Remedial and Control Cohorts Based on SAT Scores

Table 9. Pass Rates for English Remedial and Control Courses Based on SAT Scores													
SAT Verbal Scores	Remedial Status	University N						University S					
		First Year		Second Year		Third Year		First Year		Second Year		Third Year	
		No.	% Pass	No.	% Pass	No.	% Pass	No.	% Pass	No.	% Pass	No.	% Pass
1981 Freshmen													
200 - 340	Control	384	55	244	68	178	77	169	53	115	62	83	72
200 - 340	English	229	45	140	56	91	70	152	43	101	60	80	61
350 - 440	Control	823	76	627	83	474	92	697	69	511	78	372	79
350 - 400	English	113	61	79	77	58	90	189	66	139	68	106	72
450 - 800	Control	796	86	612	91	499	93	843	77	640	86	481	89
450 - 800	English	7	86	5	60	3	67	45	67	30	73	24	71
	Chi-Square	16.66*		9.71*		3.60		5.77		9.17*		10.38*	
1982 Freshmen													
200 - 340	Control	404	62	283	77			149	59	105	76		
200 - 340	English	214	54	143	64			201	40	125	48		
350 - 440	Control	907	78	673	90			765	69	567	79		
350 - 440	English	83	65	59	90			175	58	133	70		
450 - 800	Control	969	83	739	92			826	74	612	82		
450 - 800	English	5	40	3	67			34	53	25	80		
	Chi-Square	15.16*		9.85*				26.43*		24.04*			
1983 Freshmen													
200 - 340	Control	395	63					194	60				
200 - 340	English	205	54					204	42				
350 - 440	Control	872	78					957	69				
350 - 440	English	80	65					151	58				
450 - 800	Control	844	84					995	70				
450 - 800	English	13	46					32	69				
	Chi-Square	20.50*						19.57*					

* p = .05 for 7.81 and 3 df

Table 4. Pass-Fail Rates for Mathematics Remedial and Control Cohorts Based on SAT Math Scores

SAT Math Scores	Remedial Status	University N						University S					
		First Year		Second Year		Third Year		First Year		Second Year		Third Year	
		No.	% Pass	No.	% Pass	No.	% Pass	No.	% Pass	No.	% Pass	No.	% Pass
1981 Freshmen													
200 - 340	Control	259	51	152	66	109	81	112	49	62	61	44	68
200 - 340	Math	15	40	8	50	5	60	64	34	45	44	33	52
350 - 440	Control	570	74	409	79	310	86	434	64	321	74	228	75
350 - 440	Math	36	69	26	58	19	79	131	58	93	70	61	69
450 - 800	Control	1,175	83	923	89	733	93	1,206	74	905	83	700	85
450 - 800	Math	50	78	43	88	36	83	148	77	110	72	80	82
	Chi-Square	1.79		6.72		5.74		5.69		11.74*		3.72	
1982 Freshmen													
200 - 340	Control	255	60	168	75			92	51	59	68		
200 - 340	Math	43	56	30	73			99	27	52	42		
350 - 440	Control	615	75	457	88			462	67	340	80		
350 - 400	Math	74	74	59	88			152	52	108	57		
450 - 800	Control	1,413	81	1,072	91			1,209	71	907	80		
450 - 800	Math	88	77	73	84			136	74	101	76		
	Chi-Square	1.23		3.84				22.84*		29.45*			
1983 Freshmen													
200 - 340	Control	250	68					131	52				
200 - 340	Math	144	68					101	47				
350 - 440	Control	644	76					583	68				
350 - 440	Math	183	72					158	63				
450 - 800	Control	1,217	81					1,411	68				
450 - 800	Math	108	72					149	69				
	Chi-Square	5.34						1.36					

*p = .05 for 7.81 and 3 df

The one significant result was due to the particularly poor performance of the remedial cohorts at the two lowest SAT-Math levels in one freshman class at one of the two universities. At the end of two years, the average remedial cohort had 67% passing as compared to 78% passing for the average nonremedial cohort. The differences were significant for the two freshman classes at one university but not at the other. At the end of three years cohort sizes had declined and the null hypothesis could not be rejected at either university. The unweighted average was 71% passing for remedial mathematics as compared to 81% passing for nonremedial cohorts.

DISCUSSION

The natural expectation would be that the inadequately prepared students would be less likely to remain in school. The persistence rates of the remedial and nonremedial students were very similar, generally not significantly different. Reasonably consistent results were found from year to year and at both universities. Perhaps the English and mathematics course experiences encouraged these poorly prepared students to continue in school at nearly the same rate as other students.

While they persist, these underprepared students did not earn passing grades as often as other students. The remedial English students had lower passing rates than nonremedial students. The differences were large enough usually to be significant and were consistent from one freshman group to the other at each university. It is not clear why similar large differences in success did not appear between the remedial mathematics and

nonremedial students. Perhaps the wider ranging language skills involved in English remediation were more difficult to improve, or it may have been easier for the student to avoid isolated courses which require mathematical skills he does not have.

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